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10/715,476	11/19/2003	Makoto Shizukuishi	0649-0923P	3741

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EXAMINER	
HSU, AMY R	
ART UNIT	**PAPER NUMBER**
2609	

NOTIFICATION DATE	DELIVERY MODE
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

mailroom@bskb.com

Office Action Summary	Application No.	Applicant(s)	
	10/715,476	SHIZUKUISHI, MAKOTO	
	Examiner	Art Unit	
	Amy Hsu	2609	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *11/19/2003*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-44* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-44* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *20 January 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *1/20/2004*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA) and the Intellectual Property and High Technology Technical Amendments Act of 2002 do not apply when the reference is a U.S. patent resulting directly or indirectly from an international application filed before November 29, 2000. Therefore, the prior art date of the reference is determined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (pre-AIPA 35 U.S.C. 102(e)).

2. Claims 1-7, 11-13, 15-16, 18-27, 31-33, 35-36, 39-40, 42-44 are rejected under 35 U.S.C. 102(e) as being anticipated by Itano et al. (US 7,139,028).

Regarding Claims 1,19,43, Itano teaches a color solid-state image pickup device including a plurality of photoelectric conversion areas provided in an array pattern on a surface of a semiconductor substrate, wherein the inside of each of said photoelectric conversion areas is two-dimensionally partitioned into a plurality of segments which output a plurality of photoelectric conversion signals of different spectral sensitivities (*Fig. 7, Fig. 10, and Col 4 Line 59 through Col 5 Line14).*

Regarding Claim 2 and 44, Itano teaches a color solid-state image pickup device including a plurality of photoelectric conversion areas provided in an array pattern on a surface of a semiconductor substrate, wherein an inside of each of said photoelectric conversion areas is two-dimensionally partitioned into a plurality of segments which store signal electric charges of different spectral sensitivities, and transfer channels are formed beside said photoelectric conversion areas for transferring said signal electric charges read from a plurality of said segments (*Fig. 8 and Col 5 Lines 35-40)*.

Regarding Claims 3 and 20, Itano teaches the color solid-state image pickup device according to claim 1, wherein the surface of said semiconductor substrate is covered with a light-shielding film having apertures corresponding to said respective photoelectric conversion areas (*Fig. 10, Fig. 12, and Col 6 Lines 45-50)*.

Regarding Claims 4 and 21, Itano teaches the color solid-state image pickup device according to claim 3, wherein the diameter or diagonal dimension of said aperture is larger than the wavelength of incident light (*Fig. 7 shows different sections that transmit certain color lights as indicated in the drawing, this would require the aperture to receive the incident light of wavelengths corresponding to red, blue, and green, so the aperture must be large enough to allow the wavelengths of incident light)* and smaller than the diameter or diagonal dimension of said photoelectric conversion area (*Fig. 10 cross section view depicts the aperture smaller than the photodiode)*.

Regarding Claims 5 and 25, Itano teaches the color solid-state image pickup device according to claim 1, wherein the spectral sensitivity of at least one segment is determined by a color filter provided at a position above said segment (*Col 5 Lines 2-11).*

Regarding Claims 6 and 26, Itano teaches the color solid-state image pickup device according to claim 1, wherein the spectral sensitivity of at least one segment of said photoelectric conversion area is determined by the distribution of impurities in a depthwise direction of said segment. Col 8 Lines 8-16 describe the area of Fig. 12 between the microlens which focuses light to the photodiode, and the photodiode which collects the light, and describes the distribution of impurities in a depth wise direction, in this particular example listed it is silicon distributed in a 200nm depth. The impurity and the depth of the different layers between the microlens and the photodiode will determine the spectral sensitivity.

Regarding Claims 7 and 27, Itano teaches the color solid-state image pickup device according to claim 1, wherein the spectral sensitivity of at least one segment is determined by a color filter provided at a position above said segment as well as by the distribution of impurities in a depthwise direction of said segment. See Fig. 10.

Regarding Claims 11 and 31, Itano teaches the color solid-state image pickup device according to claim 1, wherein each of said photoelectric conversion areas is two-dimensionally partitioned into at least three segments, that is, a segment having red spectral sensitivity, a segment having green spectral sensitivity, and a segment having blue spectral sensitivity (*Fig. 7*).

Regarding Claims 12 and 32, Itano teaches the color solid-state image pickup device according to claim 1, wherein each of said photoelectric conversion areas is two-dimensionally partitioned into at least four segments, that is, a segment having yellow spectral sensitivity, a segment having cyan spectral sensitivity, a segment having magenta spectral sensitivity, and a segment having green spectral sensitivity (*Col 7 Lines 34-35)*.

Regarding Claims 13 and 33, Itano teaches the color solid-state image pickup device according to claims 11, wherein each of said photoelectric conversion areas is two-dimensionally partitioned into at least four segments, that is, a segment having red spectral sensitivity, a segment having green spectral sensitivity, a segment having blue spectral sensitivity, and a segment having a green spectral sensitivity, where green can be considered to have a peak that appears in the vicinity of a wavelength of 520 nm (Fig. 7).

Regarding Claims 15 and 35, Itano teaches the color solid-state image pickup device according to claim 1, wherein arrangement of segments having the same spectral sensitivity differs from one photoelectric conversion area to an adjacent photoelectric conversion area. Fig. 7 shows an example of the arrangement of green segments, or segments having the same spectral sensitivity of green, differs from one area, which is the two segments on the left side, as compared with an adjacent area, which is the two segments on the right side, specifically that the left side area has the green segment on the bottom and the ride side area has the green segment on the top.

Regarding Claims 16 and 36, Itano teaches the color solid-state image pickup device according to claim 1, wherein at least one of said segments in said photoelectric conversion areas differs in area from the other segments. Fig. 7 shows an example of at least one segment, the blue segment, differs in area from the other segments, specifically the green segments, with the blue segment having half the area of the green segments.

Regarding Claims 18 and 40, Itano teaches the color solid-state image pickup device according to claim 1, wherein said color solid-state image pickup device is used for a digital camera (*Col 7 Lines 19-21).*

Regarding Claim 22, Itano teaches the MOS image sensor according to claim 20, wherein one microlens (*Fig. 12 reference number 27)* is provided so as to correspond to one aperture (*Fig. 12 the aperture is the break in reference number 24)*.

Regarding Claim 23, Itano teaches the MOS image sensor according to claim 19, wherein photoelectric conversion signals are sequentially read from respective segments into which said photoelectric conversion area is two-dimensionally partitioned (*Col 5 Lines 27-30)*.

Regarding Claim 24, Itano teaches the MOS image sensor according to claim 23, wherein the photoelectric conversion signals read from said respective segments are output to a common signal line (*Fig. 8 and Col 5 Lines 25-29)*.

Regarding Claim 39, Itano teaches the MOS image sensor according to claim 19, wherein the image sensor is of active type. Fig. 15 depicts a standard CMOS active pixel sensor with the standard three transistors and photodiode.

Regarding Claim 42, Itano teaches the MOS image sensor according to claim 19, wherein said array pattern is arranged in a grid pattern as seen in Fig 8.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claim 38 is rejected under 35 U.S.C. 103(a) as being unpatentable over Itano et al. (US 7,139,028).

Regarding Claim 38, Itano teaches the MOS image sensor according to claim 19, but fails to teach the image sensor is specifically of passive type.

It would have been obvious to one of ordinary skill in the art at the time of the invention to use a passive type image sensor, which is less expensive than an active type sensor, and is widely used in low-end digital cameras.

5. Claims 8-10 and 28-30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Itano et al. (US 7,139,028) in view of Suzuki et al. (US 6,933,972).

Regarding Claims 8 and 28, Itano teaches the color solid-state image pickup device according to claim 6, and depicts a cross section view in Fig. 10 but fails to specifically teach the doping of each layer.

Since Itano is silent on the details such as polarity of each layer, one of ordinary skill in the art would look to prior art such as Suzuki, which teaches in Fig. 12 a solid state image pickup device where one segment has a p-well layer (*Fig. 12 reference*

number 1a) in an n-type substrate (*Fig. 12 reference number 1)*, and an n-type impurity layer formed in the p-well layer (*Fig. 12 reference number 10a, Col 19 Lines 42-49)*. One of ordinary skill in the art will recognize that spectral sensitivity of the photodiode is determined by the depth of the layers formed on the substrate because such technology makes use of the dependence on the light's wavelength of optical absorption and free carrier generation inside the semiconductor material, and also the light's penetration depth into the semiconductor material increases with increased wavelength.

It would be obvious to one of ordinary skill in the art at the time of the invention to modify the teaching of Itano by using the specific arrangement taught by Suzuki because varying the depth of the layers corresponds to the wavelength of light, or color focused on the photodiode.

Regarding Claims 9 –10 and 29-30, Itano teaches a color solid-state image pickup device divided into sections, which absorb different colors in Fig. 7. Fig. 12 represents a cross section view of one of said sections. Each of the sections including the red section, blue section, and green section will have a cross section depicted by Fig. 12. As stated in the section regarding Claim 8, Suzuki further teaches the structure of the semiconductor having a p well layer and an n-type impurity later in the p well layer. It would be obvious to one or ordinary skill in the art to vary both of said layers in depth corresponding to the color of light absorbed. The layers will be thinner for blue spectral sensitivity, and will be relatively deeper for green spectral sensitivity,

and will further be deeper for the segment having red spectral sensitivity because one of ordinary skill in the art will recognize that penetration depth of the light into the semiconductor material is directly dependent on the wavelength of light. Therefore red light with relatively longer wavelength than green light will penetrate deeper into the semiconductor material and thus requires a thicker semiconductor layer to absorb focused red light relative to green.

6. Claim 41 is rejected under 35 U.S.C. 103(a) as being unpatentable over Itano et al. (US 7,139,028) in view of Sugimori et al. (US 5,289,269).

Regarding Claim 41, Itano teaches the color solid-state image pickup device according to claim 1, but fails to teach array pattern is arranged by offsetting odd lines from even lines by half a pitch.

It is well known in the art to interlace signals from CCDs by offsetting odd lines from even lines by half a pitch. The concept is taught by Sugimori *(Col 1 Lines 15-19 and Fig. 10)*. Sugimori applies the concept to produce a non-interlaced system *(Fig. 4)*, which is desired to avoid enlarging the circuit, and avoid adding to the cost of the circuit.

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the teaching of Itano with the teaching of Sugimori because arranging the pixels by offsetting the odd lines from even liens by half a pitch opens up many possibilities to enhance the light signals from the pixels and thus create a more efficient circuit.

7. Claims 17 and 37 are rejected under 35 U.S.C. 103(a) as being unpatentable over Itano et al. (US 7,139,028) in view of Ohzu (US 5,506,430).

Regarding Claims 17 and 37, Itano teaches the color solid-state image pickup device according to claim 16, but fails to teach the limitations of Claim 17.

Ohzu teaches a solid-state image pickup device with different areas outputting different color signals. The areas of said segments in the photoelectric conversion areas are inversely proportional to the magnitude of relative spectral sensitivity per unit area of each segment (*Col 6 Lines 50-58).*

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the teaching of Itano with the teaching of Ohzu because changing areas of the segments in the photoelectric conversion areas is an effective way of controlling the spectral sensitivity of the area due to the well known fact that area of the segment is inversely proportional to the spectral sensitivity.

8. Claims 14 and 34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Itano et al. (US 7,139,028) in view of Tabei (US 5,063,439).

Regarding Claims 14 and 34, Itano teaches the color solid-state image pickup device according to claim 13, but fails to teach the limitations of Claim 14.

Tabei teaches a solid state pickup system and focuses on techniques for improved color reproducibility, including processing performed by means of a signal read from said segment having spectral sensitivity whose peak appears in the vicinity of

a wavelength of 520 nm (*Fig. 1, 3)*, thereby performing color reproduction analogous to a color matching function (*Fig. 9 and Col 2).*

It would have been obvious to one of ordinary skill in the art at the time of the invention to combine the teachings of Itano with the teachings of Tabei to improve the color reproducibility.

Conclusion

9. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Kondo (US 6829008), Suda (US 20030063204), Ishida (US 6046466), Hehemann (US 7141833), and Takahashi (US 5786588).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Amy Hsu whose telephone number is 571-270-3012. The examiner can normally be reached on M-F 8am-5pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Chris Kelley can be reached on 571-272-7331. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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